Attachment 1
Machine translation of JP 2003-229156

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]A fuel cell generation system comprising:
gaseous hydrocarbon system fuel -- hydrogen -- a reforming means reformed to rich fuel gas.
A fuel cell generated using fuel gas supplied from this reforming means, and a purging means which purges said fuel cell using said hydrocarbon system fuel when predetermined purge directions are made.

[Claim 2]The fuel cell generation system according to claim 1 in which said hydrocarbon system fuel is town gas.
[Claim 3]A fuel cell generation system which is the fuel cell generation system according to claim 2, and is a means to purge using town gas after it had a desulfurization means to remove sulfur content of town gas and said purging means was desulfurized by said desulfurization means.
[Claim 4]Claims 1 thru/or 3 provided with a combustion means which burns a combustible component in exhaust gas discharged in the case of a purge by said purging means are the fuel cell generation systems of a statement either.
[Claim 5]The fuel cell generation system according to claim 4 which is a means by which said combustion means can burn hydrocarbon system fuel used for a purge.
[Claim 6]The fuel cell generation system according to claim 4 or 5 which is the combustion part provided in this reforming means in order that said combustion means might acquire heat required for a reforming reaction in said reforming means.
[Claim 7]As for said purging means, claims 1 thru/or 6 which are means to purge said reforming means using said hydrocarbon system fuel are the fuel cell generation systems of a statement either.

[Claim 8]The fuel cell generation system according to claim 7 which is a means for said purging means to pour said hydrocarbon system fuel in order of a reforming means and a fuel cell, and to purge.
[Claim 9]The fuel cell generation system according to claim 7 or 8 which is a means to supplement this reforming means with said hydrocarbon system fuel after specified time elapse after said purging means completes a purge of said reforming means and said fuel cell.
[Claim 10]Claims 1 thru/or 9 which change into electric power of a request of direct current power from said fuel cell, and are provided with a power conversion feeding means which can be supplied to an electric power supply line from other system power supplies to load are the fuel cell generation systems of a statement either.
[Claim 11]Claims 1 thru/or 10 provided with a hot-water-storing means which carries out hot water storing of the water warmed using heat from said fuel cell at least are the fuel cell generation systems of a statement either.
[Claim 12]hydrogen obtained considering gaseous hydrocarbon system fuel as a reforming raw material -- a purging method of a fuel cell which purges a fuel cell generated using rich fuel gas using this hydrocarbon system fuel.
[Claim 13]A purging method of the fuel cell according to claim 12 in which said hydrocarbon system fuel is town gas.
[Claim 14]A purging method of the fuel cell according to claim 13 which purges a fuel cell using town

gas after desulfurizing.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the purging method of a fuel cell generation system and a fuel cell.
[0002]
[Description of the Prior Art]Conventionally, what is purged using combustion gas as a purging method of this kind of fuel cell is proposed (for example, JP,2000-243423,A etc.). An anode is purged by the reducing atmosphere gas produced by carrying out premixed combustion of the cathode off-gas discharged from the cathode of a fuel cell in this purging method using the gas containing hydrogen, By purging a cathode by the oxidizing atmosphere gas produced by carrying out premixed combustion of the anode off-gas discharged from an anode using the gas containing oxygen, an anode is held by reducing atmosphere, and the cathode is held and purged by the oxidizing atmosphere.
[0003]
[Problem(s) to be Solved by the Invention]However, with the purging method of such a fuel cell, since it is necessary to adjust temperature, moisture, etc. of combustion gas, a purge will take time. Since it is necessary to have the both sides of the combustion part for anode off-gas which carries out premixed combustion of the combustion part and anode off-gas for the cathode off-gas which carries out premixed combustion of the cathode off-gas, a system will become complicated.
[0004]The fuel cell generation system of this invention and the purging method of a fuel cell are made into one thing of the purpose purged without using the gas for a purge for exclusive use. The fuel cell generation system of this invention and the purging method of a fuel cell are made into one thing of the purpose purged promptly. The fuel cell generation system of this invention makes equipment which a purge takes one thing of the purpose made simple.
[0005]
[The means for solving a technical problem, and its operation and effect] The fuel cell generation system of this invention and the purging method of the fuel cell took the following means, in order to attain at least a part of above-mentioned purpose.
[0006]the fuel cell generation system of this invention -- gaseous hydrocarbon system fuel -- hydrogen, when the reforming means reformed to rich fuel gas, the fuel cell generated using the fuel gas supplied from this reforming means, and predetermined purge directions are made, Let it be a gist to have a purging means which purges said fuel cell using said hydrocarbon system fuel.
[0007]In a fuel cell generation system of this this invention, since a fuel cell is purged using hydrocarbon system fuel of a gas as a reforming raw material used by a reforming means when predetermined purge directions are made, it can purge, without using gas for a purge for exclusive use. As a result, as compared with what burns and uses off-gas from a thing for exclusive use using gas and a fuel cell for a purge, a system can be made simple. And since it is not necessary to adjust temperature, moisture, etc. of hydrocarbon system fuel, a purge can be completed promptly.
[0008]In a fuel cell generation system of such this invention, said hydrocarbon system fuel shall be town gas. In this case, it shall have a desulfurization means to remove sulfur content of town gas, and said purging means shall be a means to purge using town gas after being desulfurized by said desulfurization means.
[0009]In a fuel cell generation system of this invention, it shall have a combustion means which burns

a combustible component in exhaust gas discharged in the case of a purge by said purging means. If it carries out like this, it burns and a combustible component in exhaust gas discharged in the case of a purge can be exhausted. In a fuel cell generation system of this invention of this mode, said combustion means shall be a means which can burn hydrocarbon system fuel used for a purge. If it carries out like this, it burns and hydrocarbon system fuel used for a purge can be exhausted. In a fuel cell generation system of this invention of a mode provided with such a combustion means, said combustion means shall be the combustion part provided in this reforming means, in order to acquire heat required for a reforming reaction in said reforming means. If it carries out like this, it is not necessary to provide a combustion part for exclusive use used for combustion of hydrocarbon system fuel used for combustion and a purge of a combustible component in exhaust gas discharged in the case of a purge. As a result, a system can be made simple.

[0010]In a fuel cell generation system of this invention, said purging means shall be a means to purge said reforming means using said hydrocarbon system fuel. A reforming means can also be purged if it carries out like this.

[0011]In a fuel cell generation system of this invention of a mode with which this purging means also purges a reforming means, said purging means shall be a means to pour said hydrocarbon system fuel in order of a reforming means and a fuel cell, and to purge it. If it carries out like this, since a channel of gas which hydrocarbon system fuel is made fuel gas by reforming reaction, and is supplied to a fuel cell can be used as a channel of a purge as it is, it is not necessary to pipe for a purge. As a result, a system can be made simple.

[0012]In a fuel cell generation system of this invention of a mode with which a purging means also purges a reforming means, said purging means shall be a means to supplement this reforming means with said hydrocarbon system fuel after specified time elapse, after completing a purge of said reforming means and said fuel cell. If it carries out like this, when it changes into a low-temperature state from a state of relatively high temperature immediately after purge completion, it can control that a reforming means becomes negative pressure. As a result, air can be prevented from mixing in a reforming means.

[0013]In a fuel cell generation system of this invention, it shall change into electric power of a request of direct current power from said fuel cell, and shall have a power conversion feeding means which can be supplied to an electric power supply line from other system power supplies to load. If it carries out like this, electric power can be supplied to addition with other system power supplies.

[0014]In a fuel cell generation system of this invention, it shall have a hot-water-storing means which carries out hot water storing of the water warmed using heat from said fuel cell at least. If it carries out like this, since heat from a fuel cell can be used, energy efficiency of a system can be raised. Of course, it is good also as a thing also using heat other than heat from a fuel cell.

[0015]hydrogen from which a purging method of a fuel cell of this invention is acquired considering gaseous hydrocarbon system fuel as a reforming raw material -- let it be a gist to purge a fuel cell generated using rich fuel gas using this hydrocarbon system fuel.

[0016]According to the purging method of a fuel cell of this this invention, since hydrocarbon system fuel as a reforming raw material is used as gas for a purge, it can purge, without using gas for a purge for exclusive use. Therefore, as compared with what burns and uses off-gas from a thing for exclusive use using gas and a fuel cell for a purge, equipment required for a purge can be made simple. And since it is not necessary to adjust temperature, moisture, etc. of hydrocarbon system fuel, a purge can be completed promptly.

[0017]In a purging method of a fuel cell of such this invention, said hydrocarbon system fuel shall be town gas. In a purging method of a fuel cell of this invention of this mode, a fuel cell shall be purged using town gas after desulfurizing.

[0018]

[Embodiment of the Invention]Next, an embodiment of the invention is described using an example. Drawing 1 is a lineblock diagram showing the outline of the composition of the fuel cell generation system 20 which is one example of this invention. The fuel cell generation system 20 of an example is provided with the following.

receiving supply of town gas (13A) from the gas piping 22 so that it may illustrate -- town gas -- hydrogen -- the reformer 30 reformed to rich reformed gas.

CO selective oxidation part 34 which reduces the carbon monoxide in reformed gas and is made into fuel gas.
The fuel cell 40 generated according to electrochemical reaction in response to supply with fuel gas and air.
The heat exchanger 42 which performs heat exchange of the cooling water of the fuel cell 40, and the low-temperature hot water of the hot water storage tank 44, DC to DC converter 52 which adjusts the voltage and current of direct current power from the fuel cell 40, and is changed into desired direct current power, The inverter 54 supplied to the power line 12 which changes the changed direct current power into the commercial power 10 and alternating current power in phase, and supplies electric power to the load 16 via the breaker 14 from the commercial power 10 via the breaker 55, DC to DC converter 56 which lowers the pressure of a part of direct current power with which voltage or current was adjusted, and functions as an auxiliary machinery power supply, the negative charge force gauge 58 which detects the load power consumed by the load 16, and the electronic control unit 60 which controls the whole system.

[0019]The reformer 30, From the town gas supplied via the desulfurizer 27 and the control valve 28 except the control valve 24, the booster pump 26, and sulfur content from the gas piping 22, and the water tank 36, via the evaporator 37 by the control valve 38. the steam reforming reaction and water gas shift reaction of the following formula (1) by the steam with which the flow is adjusted, and a following formula (2) -- hydrogen -- rich reformed gas is generated. The combustion part 32 which supplies heat required for such a reaction is formed in the reformer 30, and town gas is supplied to the combustion part 32 via the control valve 24 and the booster pump 23 from the gas piping 22. The emission gas by the side of the anode of the fuel cell 40 can be supplied to the combustion part 32, and unreacted hydrogen in anode off-gas can be used now for it as fuel. When there is more hydrogen quantity in anode off-gas than the specified quantity, a part or all of anode off-gas is led to the burner 49 by operation of the valve 47 and the valve 48, and it burns, and can exhaust.
[0020]
[Equation 1]$CH_4+H_2O->CO+3H_2$ (1)
$CO+H_2O->CO_2+H_2$ (2)
[0021]CO selective oxidation part 34 according to the carbon monoxide selective oxidation catalyst (for example, catalyst by platinum and the alloy of a ruthenium) which chooses carbon monoxide and oxidizes under existence of hydrogen in response to the air supply by piping which is not illustrated. the hydrogen which carries out selective oxidation of the carbon monoxide in reformed gas and whose carbon monoxide concentration is very low (an example about several ppm) -- it is considered as rich fuel gas.
[0022]The fuel cell 40, It is constituted as a solid polymer type fuel cell which carries out the plural laminates of the single cell which consists of a separator which fuel gas and air are supplied to an anode electrode and a cathode terminal which **** an electrolyte membrane and this electrolyte membrane, this anode electrode, and a cathode terminal, and makes a septum between cells, It generates electricity according to electrochemical reaction by hydrogen in fuel gas from CO selective oxidation part 34, and oxygen in the air from Blois 41. A channel of cooling water through which it circulates is formed in the fuel cell 40, and it is held by circulating cooling water at optimal temperature (an example about 80-90 **). The heat exchanger 42 is formed in a circulation flow passage of this cooling water, low-temperature hot water supplied with the pump 46 from the hot water storage tank 44 by heat exchange with cooling water of the fuel cell 40 is warmed, and hot water storing is carried out to the hot water storage tank 44.
[0023]An output terminal which the fuel cell 40 does not illustrate is connected to the power line 12 from the commercial power 10 to the load 16 via DC to DC converter 52, the inverter 54, and the breaker 55, Direct current power from the fuel cell 40 is changed into the commercial power 10 and alternating current power in phase, is added to alternating current power from the commercial power 10, and can supply the load 16 now. Since it is constituted as a general DC to DC converter circuit or an inverter circuit, DC to DC converter 52 and the inverter 54 omit the detailed explanation. The load 16 is connected to the power line 12 via the breaker 18.
[0024]DC to DC converter 56 which functions on auxiliary machinery, such as an actuator of the

control valve 24, the booster pumps 26 and 28, Blois 41, and the pump 46, as DC power supply which supply direct current power is connected to a power line which branched from an output side of DC to DC converter 52.

[0025]The electronic control unit 60 is provided with the following.

ROM64 which is constituted as a microprocessor centering on CPU62 and memorizes a processing program other than CPU62.

RAM66 which memorizes data temporarily.

Input/output port and a communication port which are not illustrated.

In the electronic control unit 60. Each temperature from a temperature sensor which was attached to load power Po from the output current i, the voltage V, and the negative charge force gauge 58 from a current sensor and a voltage sensor in the inverter 54 which is not illustrated, the reformer 30, or CO selective oxidation part 34 and the fuel cell 40 and which is not illustrated is inputted via an input port. A driving signal to an actuator of the control valves 24 and 28 from the electronic control unit 60, the booster pumps 23 and 26, Blois 41, the circulating pump 43, the pump 46, etc., an ignition signal to the combustion part 32, a driving signal to the valves 47 and 48, A control signal to DC to DC converter 52 or DC to DC converter 56, a switching control signal to the inverter 54, a driving signal to the breaker 55, etc. are outputted via an output port.

[0026]Next, operation of a purge at the time of suspending operation of the fuel cell generation system 20 constituted in this way, especially a system is explained. Drawing 2 is a flow chart which shows an example of a purging process routine performed with the electronic control unit 60. This routine is performed, when purge directions are made after being intercepted the commercial power 10 side by the breaker 55 and turning off the inverter 54.

[0027]When this purging process routine is performed, CPU62 of the electronic control unit 60, First, suspend supply of a steam which the control valve 38 is closed, and suspends the evaporator 37 and is used for a reforming reaction, and (Step S100). Close the control valve 47, and carry out Kaisei of the control valve 48, change a combustion course of anode off-gas to a purge (Step S102), and the burner 49 is operated, and (Step S104) the combustion part 32 of the reformer 30 is stopped (Step S106). Town gas after it was supplied from the gas piping 22 by a stop of supply of a steam to the reformer 30, and stop of the combustion part 32 of the reformer 30 and being desulfurized with the desulfurizer 27, It flows extruding the reformer 30, CO selective oxidation part 34, and town gas and fuel gas that exist in the middle of a reaction in order of the fuel cell 40 without carrying out a reforming reaction with the reformer 30. At this time, gas discharged from the anode side of the fuel cell 40 is introduced into the burner 49, burns and is exhausted.

[0028]After performing such processing, it waits required for a purge to carry out time progress (Step S108), and a fuel gas system from the reformer 30 to [closes the control valve 28 and the control valve 48, and] the fuel cell 40 is sealed (Step S110). Here, time required for a purge is time required to transpose gas in the reformer 30, or CO selective oxidation part 34 and the fuel cell 40 to town gas, and can be set up with capacity of a supply flow rate of town gas, the reformer 30, CO selective oxidation part 34, and the fuel cell 40, capacity of piping of a fuel gas system, etc.

[0029]If a fuel gas system is sealed, after sealing a fuel gas system, it will wait to carry out specified time elapse (Step S112), and only the specified quantity will supply town gas to the reformer 30 (Step S114), and this routine will be ended. Here, predetermined time is set up as time taken for temperature of the reformer 30 to become to some extent low. Thus, after temperature of the reformer 30 becomes low, only the specified quantity supplies town gas to the reformer 30 in order to ease negative pressure of the reformer 30 produced with a fall of temperature.

[0030]According to the fuel cell generation system 20 of an example explained above, since the reformer 30 and the fuel cell 40 are purged using town gas as a reforming raw material as gas for a purge, it is not necessary to prepare gas only for a purge. And since a feeding passage of fuel gas from the reformer 30 to the fuel cell 40 can be used as it is, it is not necessary to perform piping for a purge. As a result, a system can be made simple. Since it is necessary to perform neither adjustment of temperature, nor adjustment of moisture to town gas used as gas for a purge, it can purge promptly.

[0031]According to the fuel cell generation system 20 of an example, since it waits for temperature of the reformer 30 to become to some extent low and town gas is supplied to the reformer 30 after

purging the reformer 30 and the fuel cell 40 using town gas, negative pressure of the reformer 30 can be eased. As a result, it can control that the open air mixes in the reformer 30.

[0032]In the fuel cell generation system 20 of an example, when after [purge completion] specified time elapse is carried out, town gas of the specified quantity shall be supplied to the reformer 30, but when temperature of the reformer 30 detects having become below temperature defined beforehand, it is good also as what supplies town gas of the specified quantity to the reformer 30. The number of times which supplies town gas to the reformer 30 after purge completion is good also as what is not limited at once, covers multiple times after purge completion, and supplies town gas to the reformer 30.

[0033]In the fuel cell generation system 20 of an example, when after [purge completion] specified time elapse is carried out, town gas of the specified quantity shall be supplied to the reformer 30, but when the sealing nature of the reformer 30 is very high, after purge completion does not interfere as what does not supply town gas to the reformer 30.

[0034]Although it led to the burner 49, and it burned and gas which is extruded by town gas and discharged from the fuel cell 40 in the case of a purging process was exhausted in the fuel cell generation system 20 of an example, it is good also as what is replaced with the burner 49, is led to the combustion part 32 of the reformer 30, and is burned and exhausted. If it carries out like this, it is not necessary to have the burner 49.

[0035]Although it shall purge with the reformer 30 and the fuel cell 40 with town gas in the fuel cell generation system 20 of an example, it is good also as what purges only the fuel cell 40 with town gas. An outline of composition of the fuel cell generation system 20B of this modification is shown in drawing 3. In the fuel cell generation system 20B of this modification. Branch the piping 70 for a purge by the latter-part side of the desulfurizer 27 of a feed pipe from the gas piping 22 to the reformer 30, connect with a feed pipe to an anode of the fuel cell 40, and the control valve 72 is attached to the piping 70 for a purge so that it may illustrate, and the control valve 76 is attached to a feed pipe to an anode of the fuel cell 40. And when purge directions are made, it replaces with a purging process routine of drawing 2, and a purging process of drawing 4 is performed. In the fuel cell generation system 20B of this modification, supply of a steam used for a reforming reaction is suspended first, and (Step S200) the combustion part 32 of the reformer 30 is stopped (Step S202). And close the control valve 28 and the control valve 76, and seal the reformer 30 and CO selective oxidation part 34, and (Step S204). Kaisei of the control valve 72 and the control valve 48 is carried out, and the control valve 47 is closed, piping for a purge is formed (Step S206), and the burner 49 is operated (Step S208). Town gas after being supplied from the gas piping 22 and desulfurized with the desulfurizer 27 is supplied to the fuel cell 40 via the piping 70 for a purge, and with the burner 49, gas discharged from the anode side of the fuel cell 40 burns, and is exhausted. In this way, if a purge is started, it will wait for time required for a purge to pass (Step S210), the control valve 24 will be closed, and supply of town gas from the gas piping 22 will be suspended (Step S212). And it waits to carry out specified time elapse until temperature of the fuel cell 40 becomes to some extent low (Step S214), town gas of a complement is supplied to canceling negative pressure of the fuel cell 40 (Step S216), and this routine is ended. The fuel cell 40 can be purged using town gas as a reforming raw material also with the fuel cell generation system 20B of such a modification. The reformer 30 is not purged in this modification. It is because the reformer 30 does not necessarily need to be purged.

[0036]Although town gas (13A) was used as a reforming raw material and used as gas for a purge in the fuel cell generation system 20 of an example, or the fuel cell generation system 20B of a modification, Propane with which town gas (12A) and a gas bomb were filled up is used as a reforming raw material, and it is good also as what is used as gas for a purge. A reforming raw material used as gas for a purge is limited to neither town gas nor propane, and if it is a gas at ordinary temperature, it is good as fuel of any influence hydrogen systems.

[0037]Although direct current power from the fuel cell 40 shall be changed with DC to DC converter 52 and the inverter 54 and the power line 12 from the commercial power 10 to the load 16 shall be supplied in the fuel cell generation system 20 of an example, or the fuel cell generation system 20B of a modification, It is good also as what is not limited for how to use direct current power from the fuel cell 40 to this, and performs what kind of how to use.

[0038]Although water warmed using heat of the fuel cell 40 shall be stored in the hot water storage tank 44 in the fuel cell generation system 20 of an example, or the fuel cell generation system 20B of a modification, it does not interfere as what is not provided with the hot water storage tank 44.
[0039]Although it shall have the desulfurizer 27 from which sulfur content of town gas is removed in the fuel cell generation system 20 of an example, or the fuel cell generation system 20B of a modification, it is not necessary to prepare the desulfurizer 27 for a case where town gas does not contain sulfur content.
[0040]As mentioned above, as for this invention, although an embodiment of the invention was described using an example, it is needless to say that it can carry out with a gestalt which becomes various within limits which are not limited to such an example at all and do not deviate from a gist of this invention.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a lineblock diagram showing the outline of the composition of the fuel cell generation system 20 which is one example of this invention.
[Drawing 2]It is a flow chart which shows an example of the purging process routine performed with the electronic control unit 60.
[Drawing 3]It is a lineblock diagram showing the outline of the composition of the fuel cell generation system 20B of a modification.
[Drawing 4]It is a flow chart which shows an example of the purging process routine performed with the fuel cell generation system 20B of a modification.
[Description of Notations]
10 Commercial power, 12 power lines, and 14 A breaker and 16 Load and 18 Breaker, 20 and 20B fuel cell generation system, 22 gas piping, and 24 and 28 Control valve, 23, 26 booster pumps, and 27 A desulfurizer and 30 A reformer and 32 Combustion part, 34 CO selective oxidation part, 36 water tanks, 37 evaporators, and 38 Control valve, 40 A fuel cell and 41 Blois and 42 A heat exchanger, 43 circulating pumps, 44 A hot water storage tank and 46 [A negative charge force gauge, 60 electronic control units, 62 CPU, 64 ROM, 66 RAM, and 68 / A timer and 70 / Piping for a purge] A pump, 52 DC to DC converters, and 54 An inverter and 55 A breaker, 56 DC to DC converters, and 58
70, 72, and 76 Control valve.

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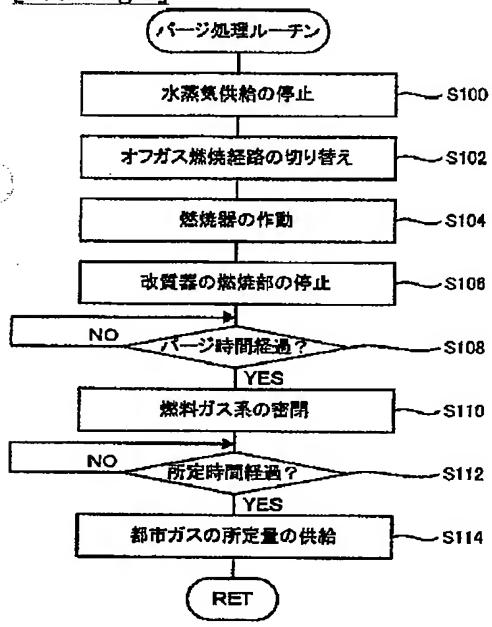
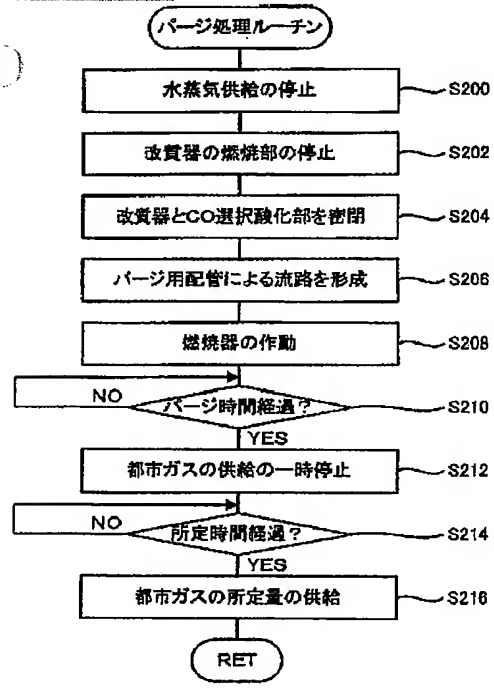
DRAWINGS

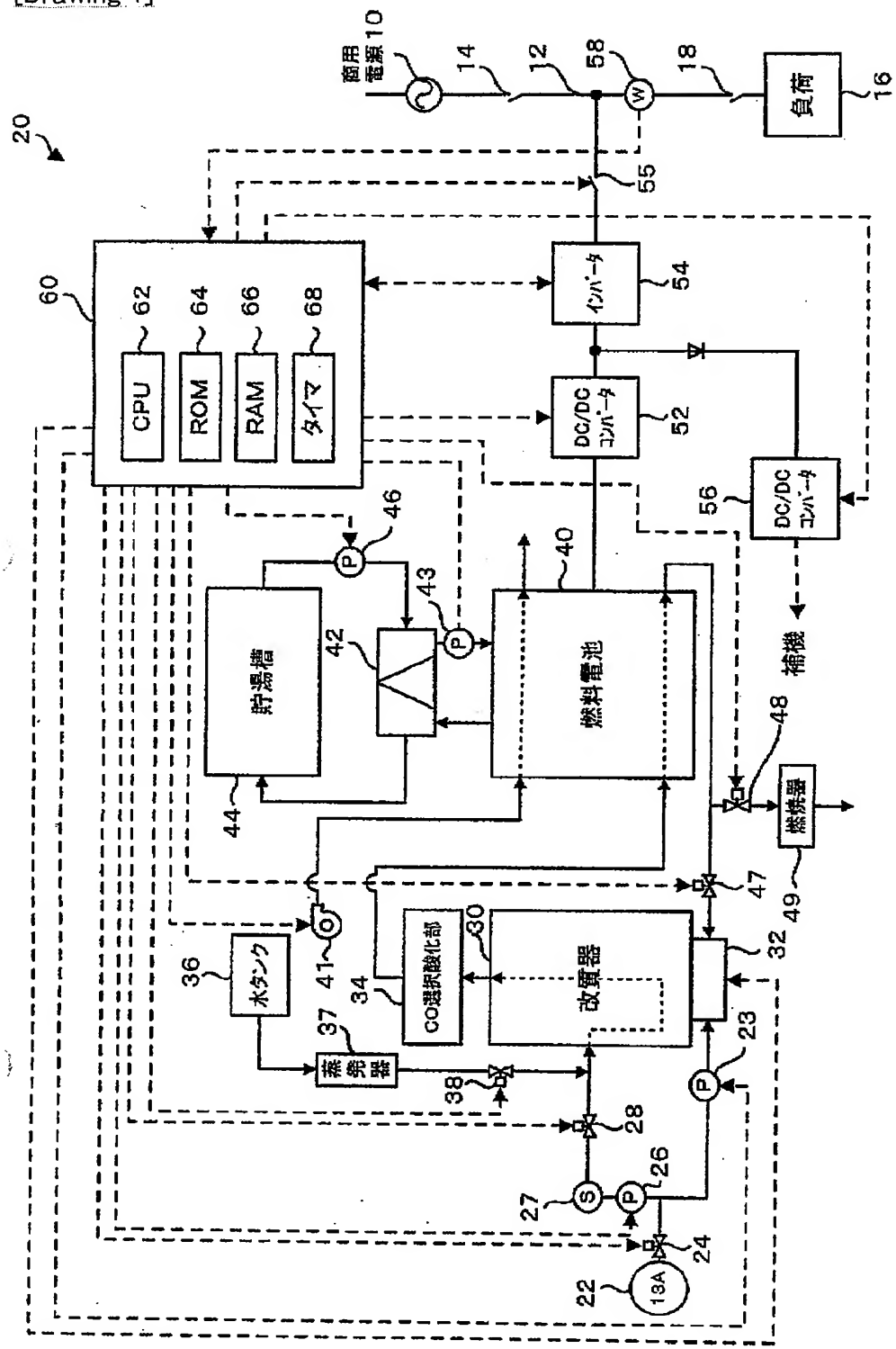
[Drawing 2]



[Drawing 4]



[Drawing 1]



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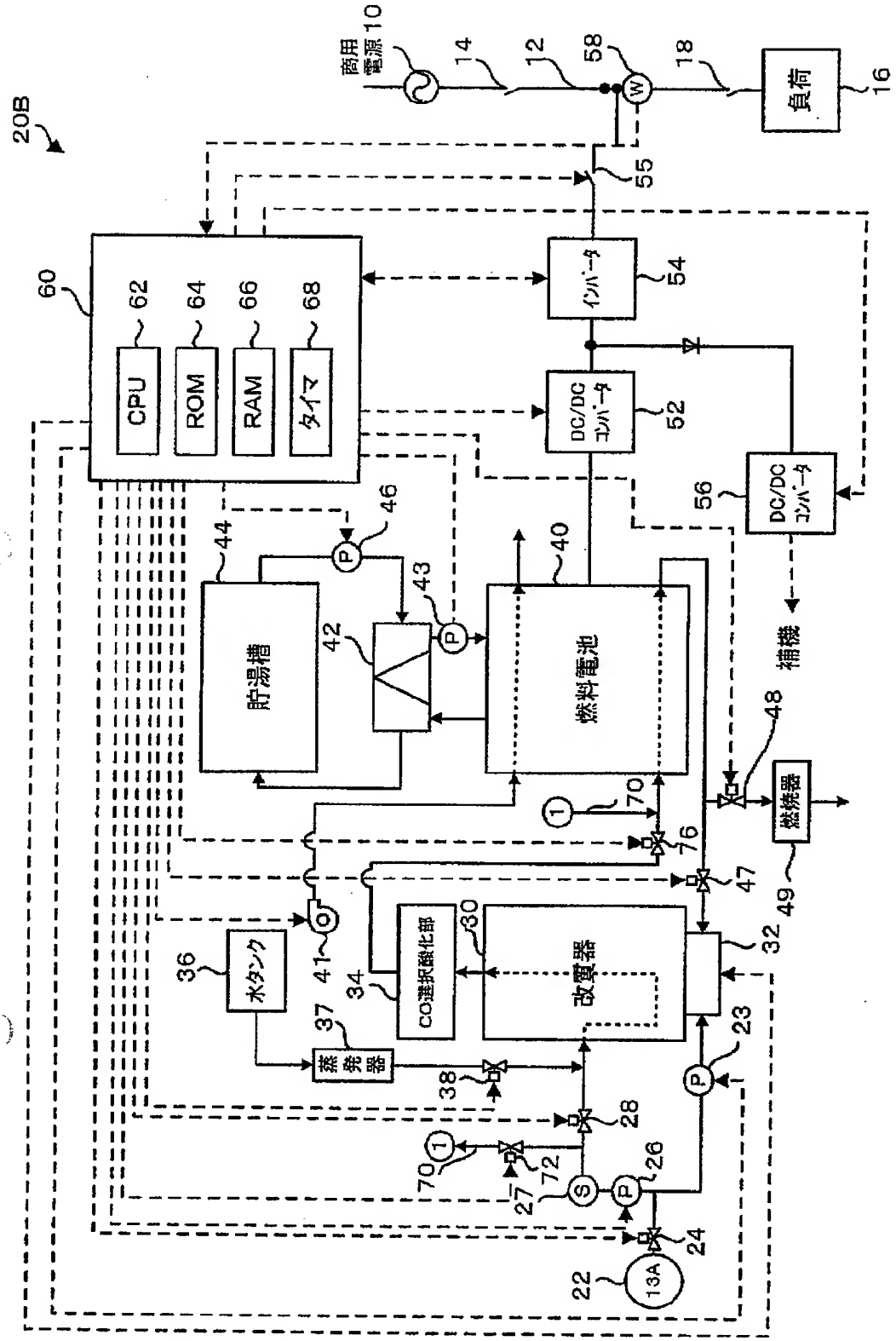

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